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Technical Report No. 3

LAMINATED WOOD MEMBERS

A Manufacturing Possibility for the Coosa Valley Area

Prepared for

Coosa Valley Area Planning
and Development Commission

by

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Foreword

As the first special market feasibility study to be completed as part of the Coosa Valley Commission program, this report marks the initiation of one of the most important new phases of work which will be done in the months ahead. In this instance, a report which previously resulted in the location of a manufacturing plant in Waycross in southeast Georgia has proved adaptable to the market, distribution, and raw material situation found in the Rome area.

Continuing effort will now go into the identification of specific products and companies which are well suited to the resource situation in northwest Georgia. The mass of data compiled during the nearly three years of basic work in the area provides an unusually strong base upon which to build this effort. At the same time, the more than 50 market analyses completed for the most part for the state as a whole have produced a list of more than 400 companies who are considered to be prospects for Georgia. It is anticipated that some of this work can be effectively adapted to the Coosa Valley Area.

Increased effort will also be put into work with established manufacturers. Many of the best bets for developing new payrolls in northwest Georgia are to be found in the growth potentials of companies already located in the area.

Work will also continue on the elimination of obstacles to industrial development in the area and on the community development work needed to make towns in the Coosa Valley as attractive as possible to industrialists looking for a southeastern location.

Questions or comments on this particular report or on any facet of the broader program will be welcomed.

Kenneth C. Wagner, Chief
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Acknowledgments

Many persons assisted in the collection of information for this publication. Although it is impossible to acknowledge individually all the help received during the preparation of this report, credit to major sources is given below:

Special thanks are due to Dr. Tze I. Chiang, Research Economist at the Industrial Development Division, for his assistance. This report is an outgrowth of his 1961 report, Laminated Wood Beams: A Manufacturing Opportunity in Georgia.

Mr. William R. Ganser, Director of Public Information of the American Institute of Timber Construction, supplied helpful information and the attractive photographs of glued laminated wood structures used in this report.

To ensure the accuracy of the wide range of data presented in this study, a large number of people in the following areas were contacted: construction, architecture, structural engineering, glulam manufacturing, and trade associations. Without their cooperation and assistance, this report would not have been possible.

Summary

A $3.42 million market for glued laminated structural members exists in the southeastern five-state area comprising the states of Alabama, Georgia, North Carolina, South Carolina, and Tennessee. With a 20% penetration of the market, a plant located in Rome, Georgia, could expect a total annual sales volume of $684,000, which would be in line with that for other plants of this type in the United States.

The production value of glued structural lumber in the U. S. increased from $10.6 million in 1947 to $60 million in 1962, a 465% growth over the 15-year period. Glued laminated structural members, such as arches, beams, and trusses, have been used largely in the construction of schools, churches, and recreation centers.

Quality control and sales are two important factors upon which the success of a "glulam" manufacturing firm lies. Skilled and experienced manpower in production areas is a key to maintaining the high standards of quality control necessary to produce glulam members that are structurally safe and economically competitive. An aggressive sales program is one of a firm's most important requirements, since much of the demand must be created for this relatively new construction process.

Rome, Georgia, with its central location in the five states and its proximity to the major markets in Atlanta, Chattanooga, and Birmingham, clearly has an over-all advantage in service to this area over existing plants in the Southeast. A Rome plant would save 24% to 64% in rail freight costs and 36% to 73% in motor freight costs over existing firms -- savings which would amount to between $5,400 and $43,000 annually on a sales volume of $644,000, the 1962 national average. These market and transportation advantages indicate that a fabricator of glued structural lumber might well consider the profit potential offered by a location in Rome, at the center of the Coosa Valley Area of northwest Georgia.

Just the existence of a new plant in the five-state area should increase the market. The proximity of a glulam plant to major population areas should generate new business and shorten the delivery time from plant to construction site.

CHARACTERISTICS OF THE GLULAM INDUSTRY

What Are Glued Laminated Structural Members?

Glued laminated structural members are specially selected and prepared wood laminations, either in straight or curved form, with the grain of all laminations approximately parallel to the length of the member and bonded with adhesives. The laminations may be of any length, thickness, or shape, depending upon design and economic considerations.

In the past two decades, the development of new adhesive and bonding techniques in the United States has greatly improved the function of wood for structural purposes and created many new uses. Laminated arches, beams, and trusses used in building churches, schools, recreation centers, theaters, and supermarkets have attracted wide attention from architects and engineers. In fact, a new industry has been created since World War II.

Glued laminated structures have been used in building bridges, ships, aircraft, and farm or commercial buildings, but the uses of glued laminated lumber are chiefly for community buildings. According to authorities in the industry, in certain regions of the United States, 75% of all new churches and 25% of all community buildings are built of glued laminated structures.

For simplicity, glued laminated structural lumber will be called "glulam" and glued laminated structural members, such as arches, beams, and trusses, will be called "glulam members." These special terms are those used by the trade.

Types of Glulam Members

Glulam members cover a wide range of products for specific use, such as arches, beams, and decking. Today standard stock beams for commercial, light industrial, and residential home construction are for all practical purposes a reality. Specific lengths can be cut from long-length stock and shipped directly to the building site. The extent to which a manufacturer can develop this ready supply would naturally depend upon his ability to know the area construction trend and to maintain contact with architects.

Other Laminated Products

Heavy-duty, laminated roof decking is a standard item for one-step roof construction that is both versatile and dependable in use. Its attractive natural finish saves the cost of extra finishing or surfacing, its strength eliminates the need for joints and purlins, and its natural insulating qualities eliminate the need for additional insulating material. This product is well adapted for use in churches, gymnasiums, schools, stores, offices, homes, and industrial buildings. Decking is manufactured in sizes ranging from 3 to 4 inches in width and, in some cases, laminated deck of 2 feet by 6 feet and 4 feet by 6 feet is produced. Different standard lengths can be produced to always give quick service upon request.

Other glulam products are standard trusses of laminated materials. Light industrial and commercial buildings provide an ideal market for fabricated trusses. They are used most commonly for such buildings as bowling alleys, shops, stores, recreation buildings, and small commercial buildings requiring post-free interiors.

Specialty items, such as laminated lighting standards and material for outdoor benches and tables, offer advantages for additional production.

Advantages and Disadvantages

Glulam members have special characteristics either in manufacture or in application which make them distinctive from other building materials. These distinctions or advantages are summarized below:

1. Larger sizes and longer spans can be achieved with glulam members than can be made from standard commercial sizes of lumber. Laminated arches with a clear span of over 300 feet have been erected; this would not be possible with solid lumber.

2. Glulam members have stimulated new approaches to building shapes and have opened fresh frontiers in design and imagination. These shapes are practically impossible to achieve economically by any other method of framing.

3. By lamination, various grades or combinations of lumber grades can be used. High-strength lumber can be used in high-stress areas; low-strength lumber can be used in low-stress areas.

4. Glulam members are free from severe checks and other seasoning defects associated with large one-piece wood members because laminations are thin enough to be readily seasoned before fabrication.

5. Less time and labor are needed on construction sites because of the prefabrication of major building components.

6. The fire resistance of glulam is approximately equal to the fire resistance of solid wood of similar sizes. Glulam members frequently do have better fire resistance than structures built with sawn timber because the members are generally larger than the members made of sawn timber. Glulam will char in a fire, but wood's natural insulating ability prevents severe penetration and protects the bulk of the member from loss of strength, as might occur on other building materials.

Unprotected steel trusses lose their strength, shape, and rigidity in a fire at relatively low temperatures, while wood roof trusses, due to low heat conductance, are not affected in the same manner. The collapse of steel trusses often pulls in the walls of a building quickly, but wood char acts as a natural insulator and often saves structural members from complete destruction or collapse.[1/]

7. Low-grade and short-length lumber can be used without adversely affecting structural strength. Thus, the timber resources of the nation are better utilized and will be improved in the long run.

8. Wood laminates can be used alone in design without the extra cost of false ceilings, boxing, or other means of concealing unattractive skeleton-like framing.

9. In over-all cost comparisons, laminated wood is 10% cheaper than steel in construction because less auxiliary materials are used in fabrication and in field application.

Glulam members, like any other building materials, have their disadvantages. High technical skill and expensive facilities are required to produce them. Although a large percentage of glulam members is custom made today, it appears that there may be a market for mass-produced non-custom products for

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1/ Frank J. Hanrahan, Heavy Timber Construction for Fire Safety, American Institute of Timber Construction, Washington, D. C., January 1960.

sale to lumber yards. Generally, sales have to be made by persons with engineering and design skills in order to service architects and engineers. In addition, glulam members are difficult to handle and expensive to ship. In some cities out-dated building codes prevent extensive use of glulam members. However, many codes have been or are being modernized.

Success of a Glulam Plant

The success of a glulam plant will depend upon how well the important areas of quality control and sales are handled.

Quality Control. One of the most important areas in production is that of quality control. The standards for the manufacture of structural laminated members are very exacting along every step of the way, from the preparation and grading of the lumber through the entire process of joining, laminating, and finishing. The plant engineer must be well versed in structural engineering and in all phases of wood laminating, for engineering skill and experience are of prime importance. In the many steps of production, other qualified people, such as experienced layout men, glue spreaders, and woodworking machine operators, are a necessity.

A well designed plant layout will facilitate over-all production and is a major area for maintaining lower production cost.

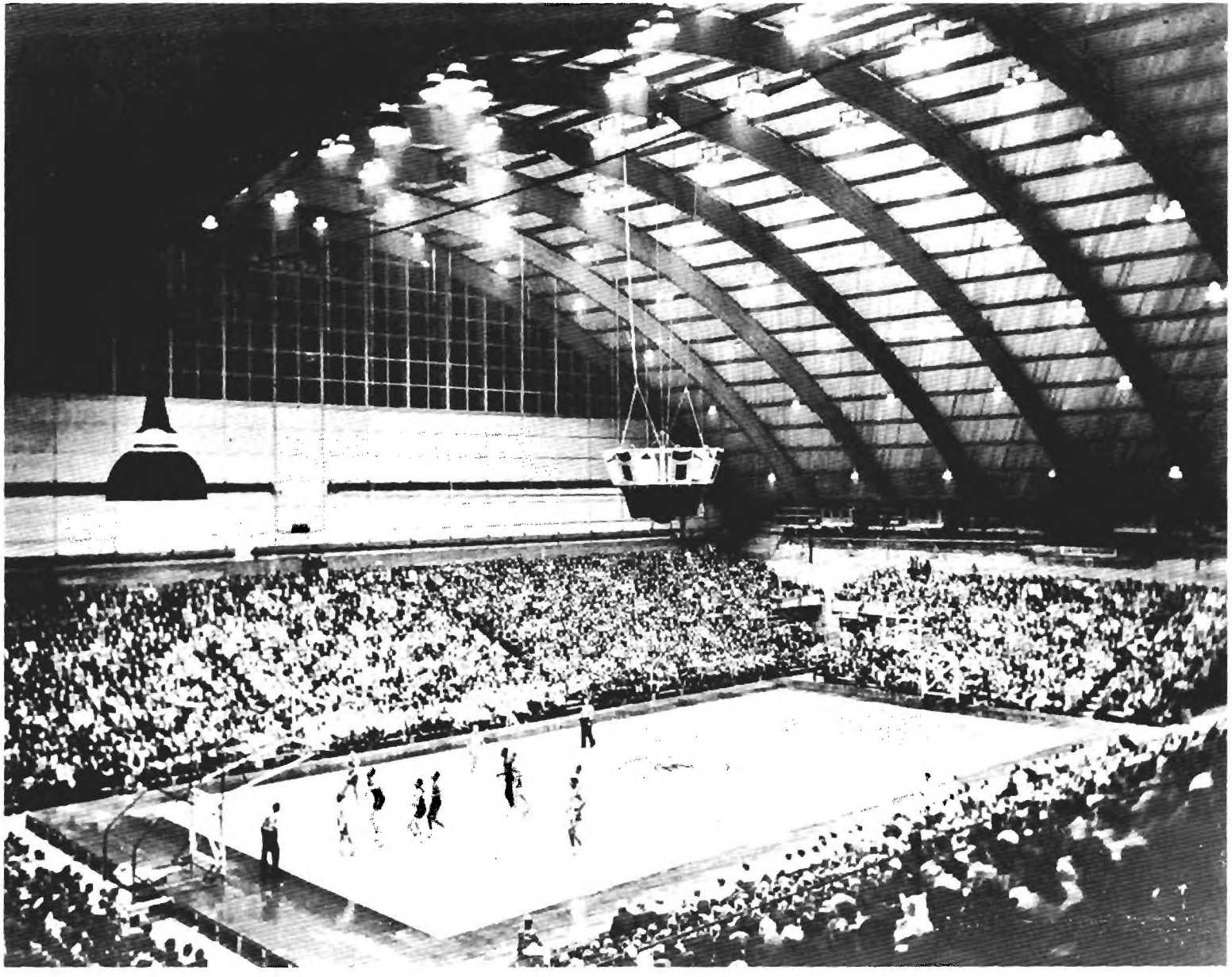
Sales. Because of the competition in the building materials industry, a glulam manufacturer has to compete with other materials in the building trade as well as with other glulam firms. A strong program of sales is necessary for a successful operation. The sales estimator, who is responsible for working up the estimates for contractors, is a key to the sales ability of the firm.

Engineering know-how must be employed on every sale. The custom nature of the industry is such that engineering is an integral part of the operation, extending through promotion, design, detailing, production, and sales.

Architects and engineers today have accepted glulam members, and it is only through a sales program which actively works toward securing their confidence in the quality of material and dependability of service that the glulam industry will be assured of an ample share of the building market.

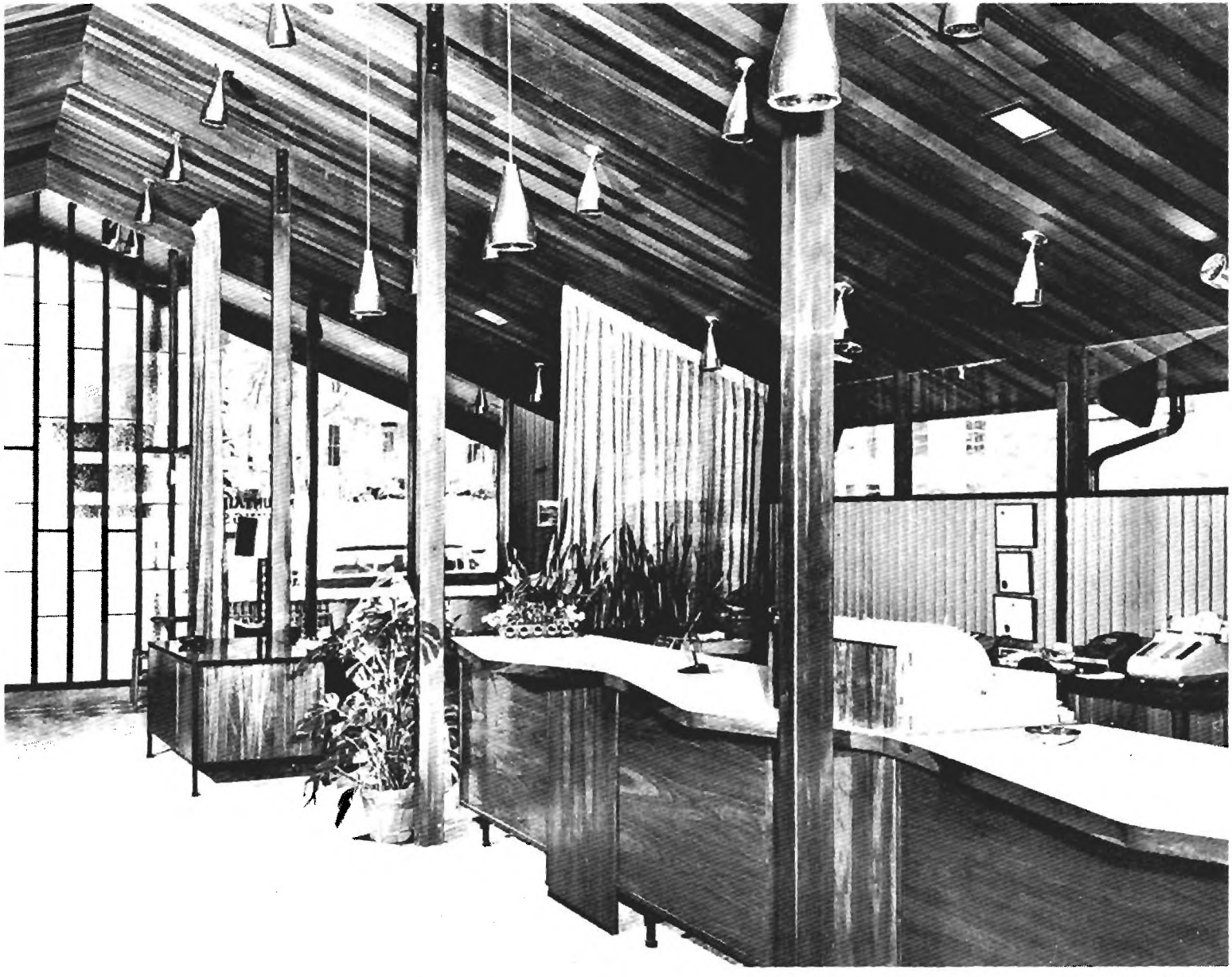
ILLUSTRATIONS OF SOME

GLUED LAMINATED STRUCTURES



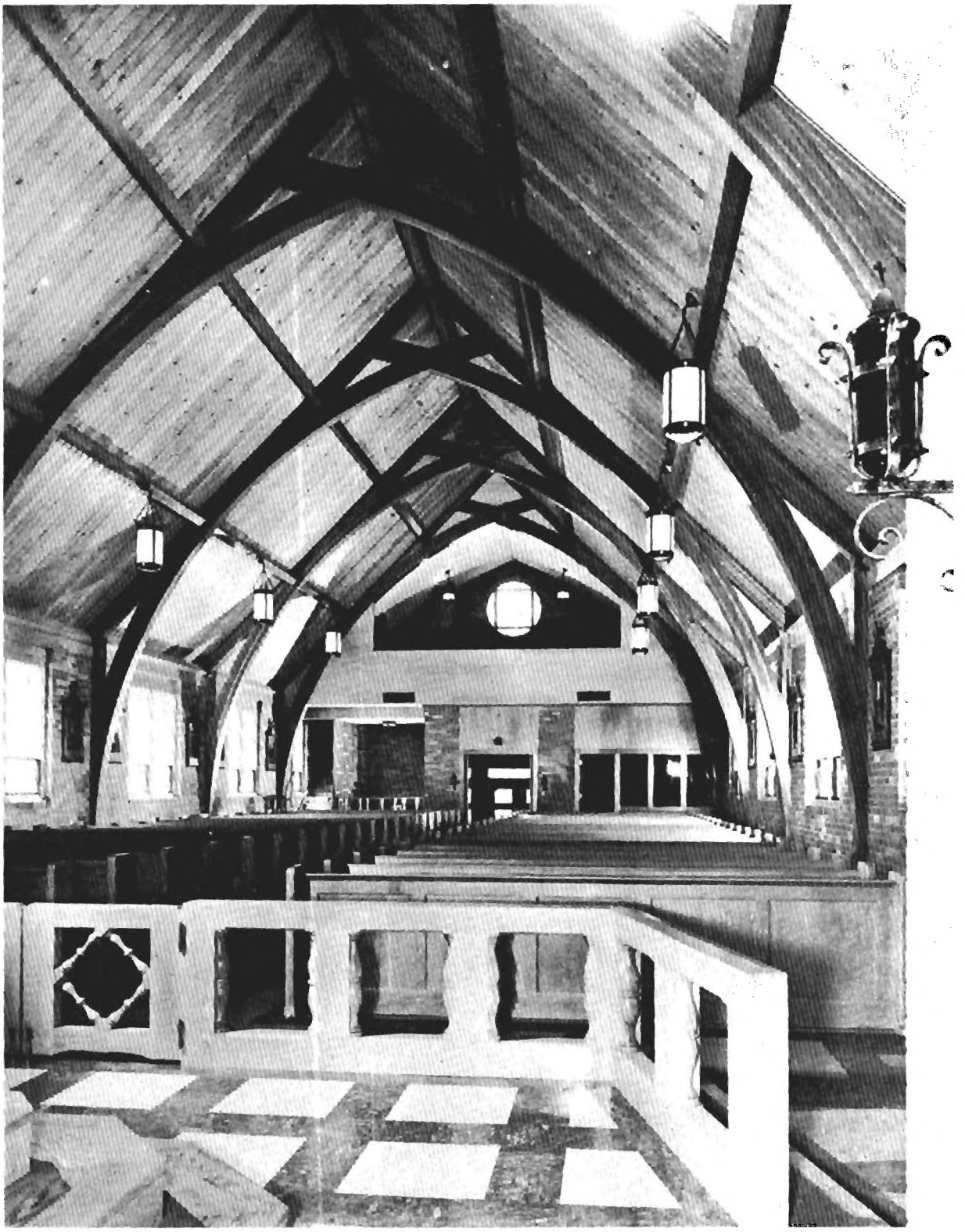
(AITC PHOTO)

GLULAM FIELD HOUSE ARCHES WITH 203–FOOT SPAN



(AITC PHOTO)

SAVINGS BANK BUILDING, BOULDER, COLORADO



(AITC PHOTO)

CHURCH IN HINCKLEY, MINNESOTA

NATIONAL MARKET

The Trend in Community Building Construction

The growth of the suburbs around various metropolitan areas, as well as smaller cities, during the 1950's marked a new trend in the population movement of the United States. At present, one-third of the nation, roughly 60 million people, live in suburbs. These suburbanites are the nation's broadening middle class and the backbone of its population. Churches, schools, recreation centers, supermarkets, and theaters spring up where suburban areas thrive and prosper.

The use of glulam buildings has risen with the current tide of suburban development in the United States. These structures have clear, wide, and post-free space, which is ideal for suburban community buildings. The simple style, easy erection, and attractive appearance of the structures account for the upsurge of glulam construction in the past decade.

The Trend in Glulam Production

The production of glulam in the United States amounted to over $10 million in 1947, $24 million in 1954, $37 million in 1958, and is estimated to have been approximately $60 million in 1962. (See Table 1.)

The over-all growth of the industry has been steady, with an increase of approximately $50 million in 15 years. In the seven-year interval from 1947 to 1954, the increase was $13.4 million, or 126% -- a simple average of 18% annually. The increase between 1954 and 1958 was over $13.7 million, and in the period from 1958 to 1962 there was an increase of $22.2 million.

Using 1947 as the base year, an index of production value was derived to indicate the relative changes since that year. Production in 1954 was two and one-quarter times the production in 1947, production in 1958 was three and one-half times, and the 1962 figure was almost six times the 1947 production figure.

Table 1

PRODUCTION VALUES OF GLULAM FABRICATED STRUCTURAL ELEMENTS
IN THE UNITED STATES FOR 1947, 1954, 1958, and 1962

Year	Production Value (000)	Increase in Production Value Between Years (000)	Average Annual Increase in Production Value (000)	Index of Production (1947 = 100)	Average Annual Rate of Increase (Per cent)
1947	$10,616			100	
		$13,427	$1,919		18.1
1954	24,043			226	
		13,709	3,427		14.3
1958	37,752			356	
		22,248	5,562		14.7
1962	60,000 (est.)			565	

Note: Average annual rate of increase is a simple average rate.

Source: U. S. Bureau of the Census, U. S. Census of Manufactures, 1947, 1954, 1958

Distribution of Manufacturing Plants

In 1964, 45 establishments were reported to specialize exclusively in producing glulam members. A majority of the plants are in the western United States. The approximate location of each establishment is shown on Map 1.

The number of plants by state and by geographic region is given in Table 2. The Western region leads with 23 plants. Second is the South Central region with seven plants. The North Central has five, with the West North Central and the South Atlantic each having four plants and the North Atlantic, two. In terms of individual states, Washington has ten, Oregon and California each have four, South Dakota and Montana each have three, six states have two each, and nine states have one plant each.

MAP 1

DISTRIBUTION OF GLULAM PLANTS IN THE UNITED STATES, 1964

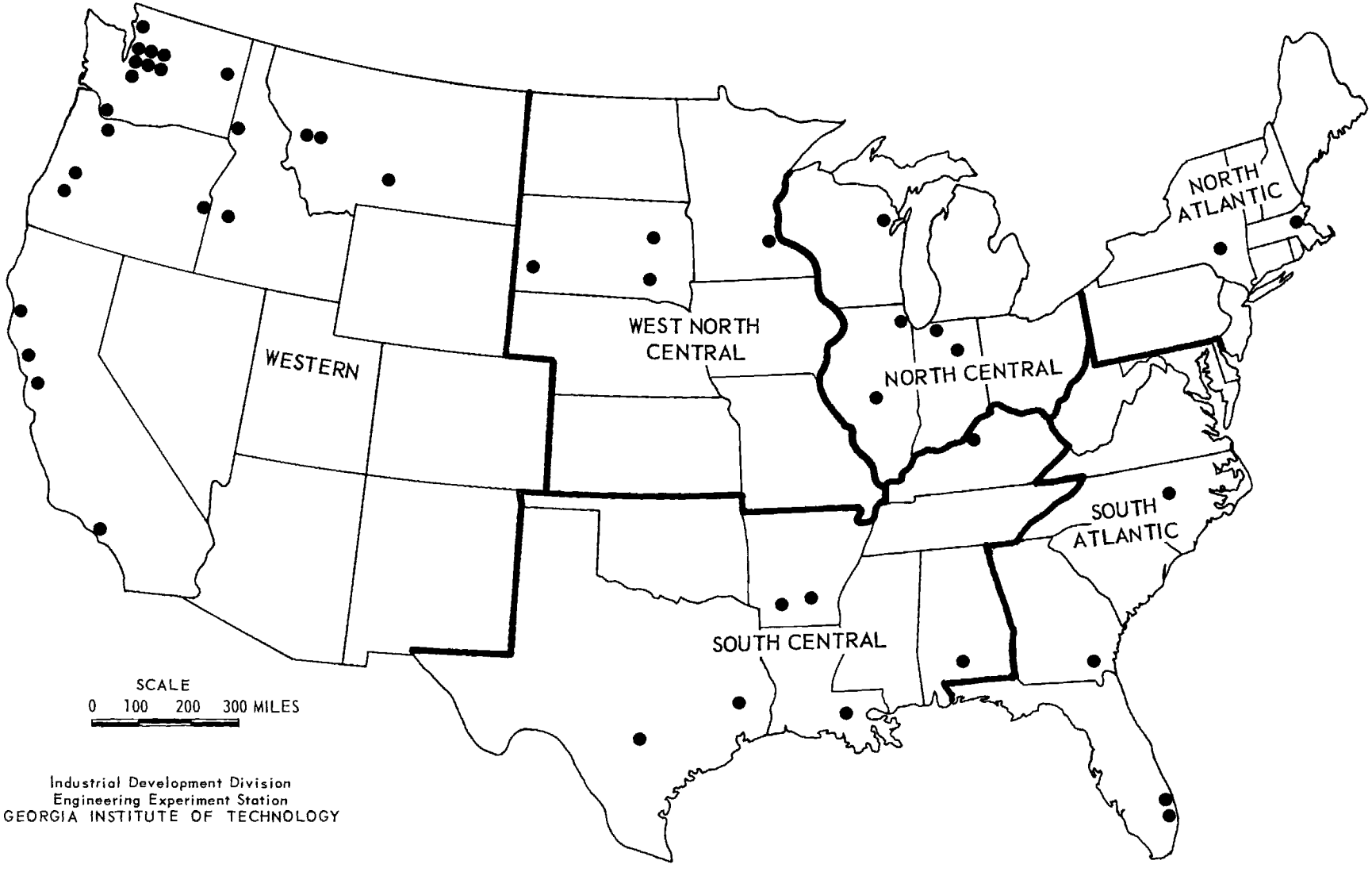


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Table 2

DISTRIBUTION OF GLULAM PLANTS BY STATE AND REGION, 1964

State and Region	No. of Plants	State and Region	No. of Plants
Massachusetts	1	Alabama	1
New York	1	Arkansas	2
North Atlantic	2	Kentucky	1
Illinois	2	Louisiana	1
Indiana	2	Texas	2
Wisconsin	1	South Central	7
North Central	5	California	4
Minnesota	1	Idaho	2
South Dakota	3	Montana	3
West North Central	4	Oregon	4
Georgia	1	Washington	10
Florida	2	Western	23
North Carolina	1	UNITED STATES TOTAL	45
South Atlantic	4		

Sources: State manufacturing directories and direct correspondence with American Institute of Timber Construction, Southern Pine Association, and individual establishments. (See Appendix 1.)

AREA MARKET

Location of Existing Plants

In the five-state area of Alabama, Georgia, North Carolina, South Carolina, and Tennessee, there are three plants manufacturing a full line of glued laminated structural members.

Georgia has one plant, located in Waycross, a distance of 308 highway miles from Rome. This firm is oriented toward the Florida and south Georgia market, although recently sales in the Atlanta area have been made.

The plant in Morrisville, North Carolina, is directing its sales north into the states of the Atlantic Seaboard as far as New York State and is not presently selling in the western Tennessee, Georgia, or Atlanta areas. This does not mean, however, that at some time this plant would not compete within the five-state area.

The Greenville, Alabama, plant, it is understood, produces a full line of glulam members, but the size of its physical facilities limits production.

Shipments of glulam members come into the five-state area from Arkansas, Louisiana, the West Coast, and the Midwest. Other plants in the South, such as those in Florida and Kentucky, have limited localized markets and do not produce a full line of glulam members.

Volume of the Area Market

Glulam members are largely used in the construction of all types of community buildings, such as churches, schools, and recreation centers. The magnitude of such building activities in five southeastern states -- Alabama, Georgia, North Carolina, South Carolina, and Tennessee -- will give a significant indication of the size of the glulam market for building purposes in the area which might be served from a Rome, Georgia, plant. Table 3 presents the markets in the five states based upon the United States glulam production value in 1962 and the ratio of each state's community building permit activity to the nation's total in the same year.

Today, laminated structural wood members account for a small portion of the total community building market. In 1962 the market for glulam members was estimated to be $2,886,000 in the southeastern five-state area. Georgia

Table 3

ESTIMATES OF THE GLULAM MARKET FOR BUILDING PURPOSES
IN THE SOUTHEASTERN FIVE-STATE AREA, 1962

State	Value of Construction Contracts (millions of dollars)[1/]	Value of all Building Permits (millions of dollars)[2/]	Community Buildings (millions of dollars)[3/]	State Community Building as Per Cent of U. S. Total[4/]	Glulam Market (thousands of dollars)[5/]	Per Cent of Total Five-State Market[6/]
Alabama	721	218.5	14	.94	564	19
Georgia	800	362.8	24	1.65	990	34
North Carolina	775	233.5	15	1.01	606	21
South Carolina	335	63.2	4	.27	162	6
Tennessee	852	212.4	14	.94	564	19
Total	3,483	1,090.4	71	4.81	2,886	99

1/ Statistical Abstract, U. S. Department of Commerce, Bureau of the Census, Washington, D. C.

2/ Figures are from Appendix 2.

3/ The ratio of the total community building permits to the total building permits in the South (6.59) was used to estimate the value of individual state's community buildings.

4/ The percentages were derived from the ratios of the estimated community building permits to the U. S. value of community building permits. (See Appendix 2.)

5/ The U. S. glulam production value was $60 million in 1962. (See Table 1.)

6/ Does not equal 100%, due to rounding of figures.

led the area with over $990,000, or 34% of the market. The markets in Alabama, North Carolina, and Tennessee are about equal, with a little over $500,000 each, or 19% to 21%. South Carolina had about 6% of the total, or $162,000. (Details are given in Table 3.)

The figures in Table 3 and the estimate of the 1962 glulam market were lerived by using building permit activity figures for the South and selected states and cities. Based on the 1962 U. S. production value of $60 million and assuming an annual increase of $5.562 million, it is estimated that the market in the five-state area will be $3.42 million in 1964. This assumes that the five states will continue to account for 4.81% of U. S. community building activity.

Since a large number of cities, towns, and rural areas do not require building permits, a great deal of building activity in the five states is not accounted for within the figures of Table 3. This difference can be seen when columns 1 and 2 are compared -- the value of construction contracts is three times the total value of building permits in the area. It is possible, therefore, that the actual glulam market is much greater than the above estimate.

The estimated 1962 and 1964 sales of glulam members in the five-state area, in terms of market value and number of units, are shown in Table 4.

Table 4

MARKET VALUE AND UNITS OF GLULAM STRUCTURES
IN THE SOUTHEASTERN FIVE-STATE AREA, 1962 AND 1964

State	Estimated Market for 1962		Projected Market for 1964	
	Value	Units	Value	Units
Alabama	$ 564,000	161	$ 668,565	191
Georgia	990,000	283	1,173,546	335
North Carolina	606,000	173	718,352	205
South Carolina	162,000	46	192,034	55
Tennessee	564,000	161	668,565	191
Total	$2,886,000	824	$3,421,062	977

The estimates and projections of unit sales in Table 4 are based on the f.o.b. price of glulam members for an average-size church with 3,500 square feet of floor space. A set of glulam structures constituting a unit for such a church includes six arches and auxiliary members and costs approximately $3,500. On this basis, the projected 1964 market of $3.42 million for glulams in the five-state area represents sales of approximately 977 units.

Prospects for the Future

The future growth of the market for glued laminated structural members will depend upon the following factors:

1. growth in number of community buildings,
2. growth in use in community buildings,
3. growth in use in residential construction,
4. growth in use in commercial-type buildings,
5. growth in building standardization to allow more stocking of glulams, and
6. growth in desire to use glulams.

New uses for glulams are found in the construction of offices, restaurants, automobile showrooms, and residential units. There is no reason why three-quarters of all buildings in the community building category and a large percentage of commercial and residential buildings could not use laminated members.

The establishment of glulam plants in Alabama, North Carolina, and south Georgia shows that a market does exist for the manufacture of glulam products. Direct contact with manufacturing agents for glulams indicates that there is room for a facility in the proximity of the Atlanta area. Furthermore, a glulam manufacturer's representative stated that upon the opening of a competitor's plant within his market area, his sales of glulam members increased. The fact that glulams were more accessible generated more interest in using them, which in turn increased the market. It seems highly likely, then, that just the existence of a plant within a few miles of the Atlanta market would increase the number of new buildings utilizing glulam members. An aggressive promotional effort also will be needed to stimulate further increases in sales in the area.

ADVANTAGES OF A NORTHWEST GEORGIA PLANT LOCATION

The Coosa Valley's Position in the Five-State Area

The Coosa Valley, located approximately in the center of the five-state area, is next door to the large Atlanta market and conveniently close to markets in the neighboring states of Alabama, North Carolina, South Carolina, and Tennessee. From the point of view of optimum sales and minimum transportation costs, the Coosa Valley is an ideal area for the location of a laminated wood member facility.

Atlanta is a major market for glulam members. Located less than 70 miles southeast of Rome, Atlanta is the largest metropolitan area in the Southeast and one of the major financial, commercial, and manufacturing centers of the nation. The total of all building permit activity in Atlanta amounted to $251.7 million in 1962 -- 69% of Georgia's total of $362.8 million. Over $15.5 million was spent in Atlanta on community buildings during this period.[1/]

It is estimated that presently in Atlanta approximately four of every ten new churches and one out of every ten community buildings of other types utilize laminated members.

One of the leading manufacturers of glulam members has established a program of locating manufacturing facilities so that they will have a service area of 500 miles. Several manufacturers have stated that actually a 300-mile radius is a more ideal situation for a plant. A short distance between a plant and the actual construction site allows for closer coordination between the plant engineer and the structural engineer who is building the building. Minimum distances between the plant and the purchasers also reduce delivery times and therefore increase sales opportunities.

Manufacturing representatives of glulam products in the Atlanta area have indicated that there is room for a second plant in the state of Georgia to supply the market. A location near to the Atlanta area which would also serve the Alabama and Tennessee market would be ideal.

1/ Appendix 2 indicates the value of all building construction and community buildings for selected metropolitan areas in the five-state southeastern area from 1957 to 1962.

A plant in Rome, the major city in the Coosa Valley Area, would be centrally located between the Atlanta, Chattanooga, and Birmingham markets. Since present sales in the Atlanta area are supplied by the Arkansas-Louisiana and other more distant manufacturers, a plant in Rome would be better able to serve the market. The Waycross plant is presently making sales in the Atlanta area, but the plant does not have rail service, and considerable trucking charges are incurred in serving the Atlanta market. A Rome facility would be four times closer to the Atlanta, Chattanooga, and Birmingham markets than the Waycross plant.

A plant in Rome with a service area only 200 miles in radius would serve a majority of the population in the states of Georgia, Alabama, and Tennessee. (See Map 2.) A large percentage and, in some cases, a majority of the more active building construction is taking place within this area.

Because of its central location in the five-state area, a Rome plant should be able to secure 20% or more of the area market. Based on the conservative estimate of $3.42 million for the 1964 glulam market in the five-state area, it is reasonable to assume that a Rome plant could develop an annual sales volume of at least $684,000.

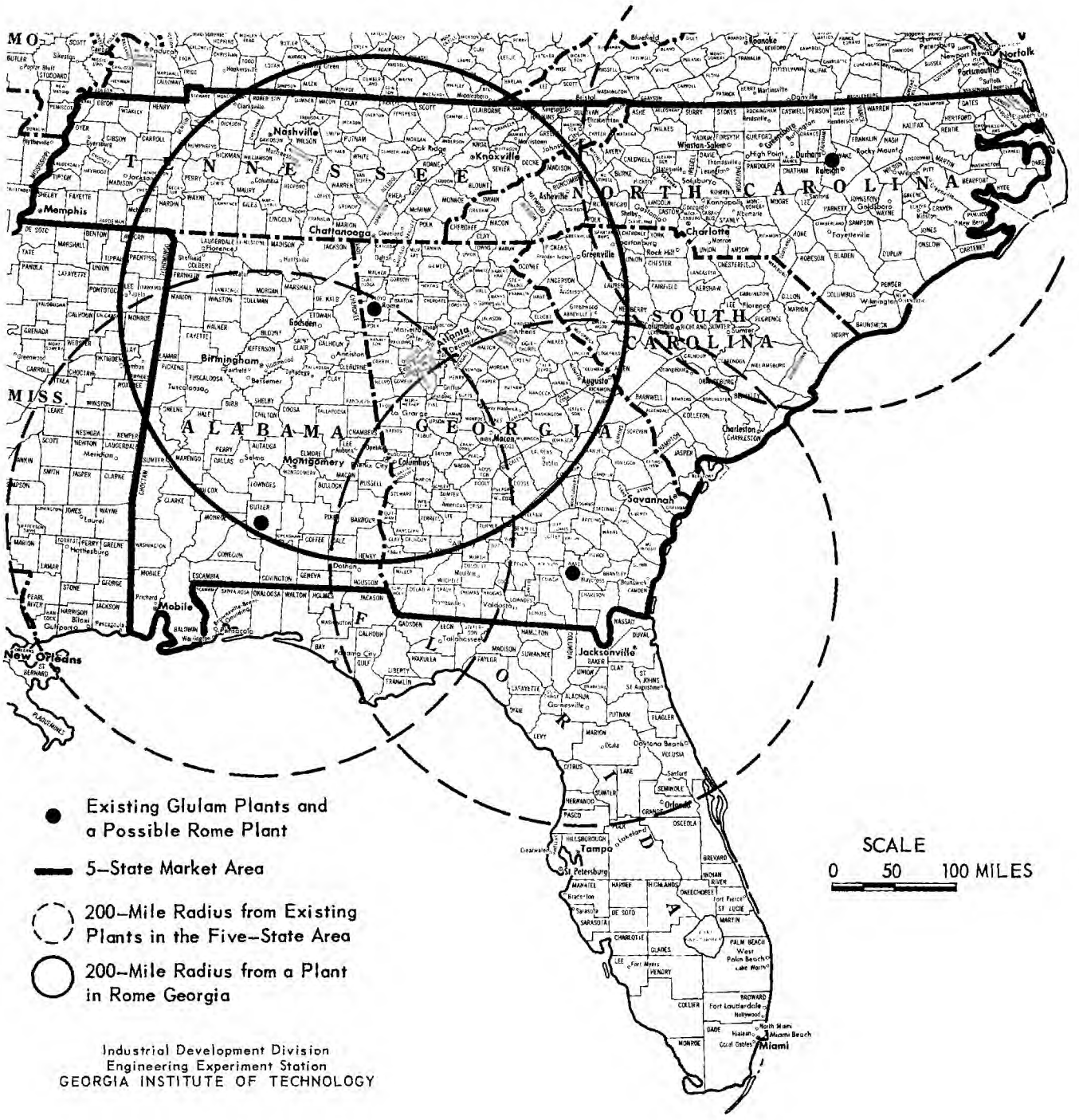
According to the 1958 U. S. Census of Manufactures, there were 150 establishments manufacturing fabricated structural framing and wood laminates in the United States.[1/] Using the 1962 total value of shipments of $96,745,000 for all products within this classification of structural framing and wood laminates and assuming that the total number of plants from 1958 remained the same, an average production of $644,966 annually per plant was estimated for 1962. Thus, the anticipated sales volume of a Rome plant would be in line with the national average.

Comparative Transportation Costs

Glulam members are shipped by both rail and truck, depending on the distance to the destination point and the size of the members involved. In considering a plant location with a service area of approximately 300 miles, truck transportation would be the most practical means for transporting these

1/ Detailed census reports for 1963 have not yet been published, so the complete 1958 Census of Manufactures was used.

MAP 2
EXISTING GLULAM MANUFACTURING PLANTS IN THE SOUTHEAST
AND A 200-MILE MARKET AREA EXTENDING FROM EACH



members. Even in those cases where rail costs are less than motor freight, when the added costs of transporting members from the rail siding to the building site are considered, the over-all cost for motor freight is generally less.

Tables 5, 6, 7, and 8 give some idea of the costs involved for rail and truck shipments and the approximate annual savings which would be realized by a plant located in Rome, Georgia.

The railroad freight rates on glulam members listed in Table 5 were furnished by the Southern Railway System. The rates are in cents per 100 pounds. Any calculation of freight rates has to be based on minimum carload weights from various points of origin and termination. The points of origin used are the existing sites of major glulam plants and a proposed Rome plant, while the points of termination are selected cities in the southeastern states. Minimum carload weights depend upon the point of origin and the rate incurred on the carload. Detailed freight rates are given in Appendix 3.

Table 5

AVERAGE CARLOAD RAIL FREIGHT RATES FOR GLULAM MEMBERS FROM FIVE ORIGINATING POINTS TO THE FIVE-STATE AREA

	FROM:									
	Rome Ga.		Waycross Ga.		Morrisville N. C.		Greenville Ala.		Magnolia Ark.	
TO:	X	Y	X	Y	X	Y	X	Y	X	Y
Atlanta	15	60	25	100	38	152	22	88	66	264
Georgia	21	84	21	84	42	168	25	100	67	268
Alabama	19	76	29	116	49	196	17	68	51	204
North Carolina	29	116	35	140	21	84	44	176	76	304
South Carolina	25	100	27	108	24	96	39	156	77	308
Tennessee	28	112	42	168	44	176	32	128	57	228

X = Cents per 100 pounds. (Figures derived by taking an average of all points within a state. See Appendix 3.)

Y = Dollars per carload. (Figures derived by multiplying the minimum weight, 40,000 pounds per carload, by the number of cents per 100 pounds.)

Note: See Appendix 3 for complete explanation of charges relative to Magnolia, Arkansas, and shipping over Memphis and Vicksburg.

Based on the estimated national production average per plant in 1962 of approximately $644,000 and an assumed average cost per manufactured unit

(arches and supporting members) of $3,500, a plant would produce approximately 184 units annually. If the total number of units is equally apportioned to each of the five states and the costs per carload from Table 5 are applied, approximate total freight charges can be estimated on annual sales. Table 6 indicates the estimated market value, number of carloads, and rail transportation costs for glulam members from Rome and the existing plants which make shipments into the five-state area. The first column in the table gives the estimated market value per plant and amount per state, and the second column lists the number of carloads of glulams sold in each state and in the five-state area by each plant. The third through the seventh columns show the estimated total freight cost from the five points of origin to the five-state area.

Atlanta and the remainder of Georgia have been shown separately because of the fact that Atlanta accounts for approximately 70% of the state's building activity.

Table 6

ANNUAL RAIL FREIGHT COST FOR GLULAM SHIPMENTS
TO THE FIVE-STATE AREA FROM ROME
AND EXISTING GLULAM PLANTS

			FROM:				
TO:	Market Value	Carloads	Rome Ga.	Waycross Ga.	Morrisville N. C.	Greenville Ala.	Magnolia Ark.
Atlanta	$ 91,000	26	$ 1,560	$ 2,600	$ 3,952	$ 2,288	$ 6,864
Georgia(remainder)	38,500	11	924	924	1,848	1,100	2,948
Alabama	129,500	37	2,812	4,292	7,252	2,516	7,548
North Carolina	129,500	37	4,292	5,180	3,108	6,512	11,248
South Carolina	126,000	36	3,600	3,888	3,456	5,616	11,088
Tennessee	129,500	37	4,144	6,216	6,521	4,736	8,436
Total	$644,000	184	$17,332	$24,100	$26,137	$22,768	$48,132

Notes: Column 1 shows an equal share of market for each state, with Atlanta and Georgia being broken down individually. An approximate total of $644,000 market value per plant is used, based upon the 1962 market value per plant.

Total number of carloads was estimated in column 2 by dividing the five-state market value total by $3,500, the average cost per unit. Each state was assigned an approximately equal share of the total units.

As can be seen from Table 6, a Rome plant could ship to the area market more cheaply than the nearest existing plants. Total transportation savings from Rome would be in excess of $5,400 over shipments from Greenville, $6,700 over Waycross, $8,800 over Morrisville, and $30,000 over Magnolia. Even though the distribution would not be equal as shown, the table does give an indication of possible savings on shipping costs. Annual rail freight cost from Rome would be from 24% to 64% cheaper than from existing plants.

Truck transportation is an efficient means for delivery of laminated structural members from a plant to a construction site because of their large size and the special handling which is required. Since rail transportation is not usually available directly to a site and, in many cases, to the community which is the destination, considerable cost is involved in removing them from rail to the building site.

Tables 7 and 8 present the truckload costs and the total annual transportation charges to the five-state area from a facility in Rome and the four existing plants in the Southeast.

Table 7

AVERAGE TRUCKLOAD FREIGHT RATES FOR GLULAM MEMBERS
FROM FIVE ORIGINATING POINTS TO THE FIVE-STATE AREA

	FROM:									
	Rome Ga.		Waycross Ga.		Morrisville N. C.		Greenville Ala.		Magnolia Ark.	
TO:	X	Y	X	Y	X	Y	X	Y	X	Y
Atlanta	9	32	33	116	51	179	27	95	81	284
Georgia	23	81	24	84	53	186	30	105	84	294
Alabama	20	70	29	102	72	252	12	42	61	214
North Carolina	38	133	47	165	25	88	59	207	107	375
South Carolina	33	116	36	126	29	102	51	178	105	368
Tennessee	19	67	58	203	62	217	43	151	106	371

X = Cents per 100 pounds. (Figures derived by taking an average of all points within a state. See Appendix 4.)

Y = Dollars per truckload. (Figures derived by multiplying the minimum weight, 35,000 pounds per truckload, by the number of cents per 100 pounds.)

The most economical means of shipping by motor freight is by company-owned trucks. The tables have been figured by obtaining rates from operators using owned equipment and by checking costs for leased equipment. There was little difference in the over-all cost, but accessability and control indicated that ownership of vehicles would be the most practical method of operation.

Of the 25 examples shown in Table 7, a Rome facility has an advantage in all but three cases. In Table 8, the above cost per truckload is used in order to find the total cost for transportation incurred in shipping glulams from Rome and existing plants to the five-state area.

Table 8

ANNUAL TRUCK FREIGHT COST FOR GLULAM SHIPMENTS
TO THE FIVE-STATE AREA FROM ROME
AND EXISTING GLULAM PLANTS

			FROM:				
TO:	Market Value	Truck-loads	Rome Ga.	Way-cross Ga.	Morris-ville N. C.	Green-ville Ala.	Mag-nolia Ark.
Atlanta	$ 91,000	26	$ 832	$ 3,016	$ 4,654	$ 2,470	$ 7,384
Georgia(remainder)	38,500	11	891	924	2,046	1,155	3,234
Alabama	129,500	37	2,590	3,774	9,324	1,554	7,918
North Carolina	129,500	37	4,921	6,105	3,256	7,659	13,875
South Carolina	126,000	36	4,176	4,536	3,672	6,408	13,248
Tennessee	129,500	37	2,479	7,511	8,029	5,587	13,727
Total	$644,000	184	$15,889	$25,866	$30,981	$24,833	$59,386

Note: Totals for "Market Value" and "Truckloads" are divided approximately equally among the states, as explained in Table 6.

The total annual motor freight costs from the points of origin to the five-state area are considerable, with a much greater saving possible from a Rome location than from the four existing plants. The amounts a Rome facility would save over the nearest existing plants are as follows: Waycross, $9,977; Morrisville, $15,092; Greenville, $8,944; and Magnolia, $43,497. Annual motor freight costs from Rome would be from 36% to 73% cheaper than from existing plants.

Lumber Supply

Trees increasingly dominate Georgia's landscape. Forests now cover 69% of the state's 37 million acres of land area, as compared with 57% in 1936. Practically all of Georgia's forest area is available for timber production; of the total 25.8 million acres qualifying as forest land, only 67,200 acres are not available for timber growing. This area consists mainly of military reservations, national monuments, and state parks.[1/]

Timber cutting is increasing in Georgia, but, for the state as a whole, softwood net growth is increasing faster than the cut and the annual growth in both pine and hardwood exceeds the annual cut. Georgia has led the South in harvesting of saw timber, with an annual cut of over three billion board feet. Data on total volume of timber on commercial forest land in Georgia for 1961 show that softwoods number 9.9 million cubic feet out of a total of 18.9 million, with the remainder being hardwood.

Within a 70-mile radius of Rome (including only that section in Georgia), there was a total of 4.421 million acres of commercial forest in 1961. This same area had, during this same period, 6,746 million board feet of all species and 2,497 million board feet of yellow pine.

Southern yellow pine and Douglas fir are used in the laminating of glulam members because of their favorable cost, availability of supply, and their ability to meet strength requirements. Generally, the glulam plants in the West use Douglas fir, west coast hemlock, or western larch, and plants in the South and East use southern yellow pine exclusively.

A major glulam plant may require 18,000 to 20,000 board feet (one or two carloads) of southern pine per day, of various standard grades and thicknesses. With the current supply of southern pine in Georgia, a glulam manufacturer in Rome can be assured of a supply adequate in both quality and quantity.

Labor

A favorable labor market in Georgia has been one of the keys in attracting new industry to the state. Georgia, along with several other southern states, has a right-to-work law. According to past records, Georgia has one of the

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1/ Georgia's Timber, Forest Service Resource Bulletin SE - 1, U. S. Department of Agriculture.

lowest work stoppage rates in the nation. Labor relationships are generally harmonious. Above all, the labor attitude has induced many favorable comments from leaders in various industries.[1/] In terms of trainability and productivity, it was reported that most new firms locating in the South reported excellent success in training southern workers for new industrial skills and that labor productivity in the South is equal, or even superior, to that in the North.

A recent survey conducted by the Employment Security Agency, Atlanta Department of Labor, reported over 820 persons in the Rome area employed in the lumber, wood products, and furniture and fixtures industries as of the first quarter of 1964. This employment figure covers the counties of Bartow, Chattooga, Floyd, Gordon, and Polk. Floyd County, in which Rome is located, accounted for 70% of this total. The estimated potential labor supply for Floyd County is approximately 3,500 males. These persons would come from the above five counties and Cherokee County, Alabama.

CONCLUSION

The location of a plant to manufacture glued laminated wood members in the Rome, Georgia, area appears to be economically feasible.

The immediate accessibility of the Atlanta, Birmingham, and Chattanooga markets, together with an over-all freight advantage in the southeastern five-state area, would assure a Rome manufacturer of a potential market of sufficient size to allow the development of a sales volume at least equal to that of an average-size glulam plant in the United States.

Both the lumber supply and the labor supply are adequate to support a glulam operation in the Rome area.

With an assured potential market, the profitability and future growth of a laminated wood member plant in Rome would depend largely on the development of a quality product and on the pursuit of an aggressive sales and promotion program.

1/ Based on personal contacts by the Northwest Georgia Branch of the Industrial Development Division, Engineering Experiment Station, Georgia Institute of Technology.

APPENDICES

Appendix 1

THE GLULAM PLANTS IN THE UNITED STATES, 1964

Association Membership

A = American Institute of Timber Construction

B = Southern Pine Association

C = California Redwood Association

North Atlantic

Unadilla Laminated Products, Inc. (A)
Unadilla, N. Y.

Wood Fabricators, Inc. (A)
400 Portland Street
Cambridge 41, Mass.

West North Central

Prairie States Wood Arts
Redfield, S. Dak.

Van Dyke Supply Co.
Woonsocket, S. Dak.

Wood Span Products Co. (A)
Highway 79 South
Rapid City, S. Dak.

Rilco Laminated Products, Inc. (A)
Div. of Weyerhaeuser Co.
St. Paul, Minn.

South Atlantic

Timber Shapes, Inc. (A, B)
1601 S. W. 20th Street
Fort Lauderdale, Fla.

Dixie Laminated, Inc. (A, B)
Waycross, Ga.

Laminated Structures (B)
2080 Scott Avenue
West Palm Beach, Fla.

Unit Structures (A, B)
Dept. of Koppers Co., Inc.
Wood Preserving Division
P. O. Box 8
Morrisville, N. C.

South Central

Bradley - Southern Division (A, B)
Potlatch Forests, Inc.
Box 390
Warren, Ark.

Ronald Coca, Inc. (A, B)
3717 Florida Avenue
Baton Rouge, La.

Gamble Brothers, Inc.
4601 Almond Avenue
Louisville 9, Ky.

W. T. Smith Timber Fabrications (A, B)
Greenville, Ala.

Stein Lumber Co. (B)
Fredericksburg, Tex.

Tex-Lam (A, B)
Diboll, Tex.

Unit Structures (A, B)
Dept. of Koppers Co., Inc.
Wood Preserving Division
Magnolia, Ark.

North Central

American Roof Truss Co.
6750 Stoney Island Ave.
Chicago, Ill.

Fabribeam Corp. (B)
P. O. Box 114
La Porte, Inc.
Plant: Pinola, Ind.

Laminated Rafters, Inc. (B)
North Detroit Street
Warsaw, Ind.

North Central (continued)

McKeown Brothers Co.
Northlake, Ill.

Unit Structures (A, B)
Dept. of Koppers Co., Inc.
Wood Preserving Division
Peshtigo, Wis.

Western

American Fabricators Co. (A)
P. O. Box 7
Bellingham, Wash.

The Anaconda Co. (A)
Lumber Dept.
Missoula, Mont.

Attwell, Inc. (A)
36th & Paine Streets
Everett, Wash.

Boise Cascade Corp. (A)
P. O. Box 217
Emmett, Idaho

Cascadian Structures, Inc. (A)
P. O. Box 183
Arlington, Wash.

Calvert Co., Inc. (A)
218 V Street
Vancouver, Wash.

Ericson Laminators, Inc. (A)
13702 Eighth Avenue East
Sumner, Wash.

Fluor Products Co., Inc. (A, C)
A Subsidiary of Fluor Corp., Ltd.
Santa Rosa, Calif.

Fountain Lam Loc Co. (A, C)
6218 South Hooper Avenue
Los Angeles 1, Calif.

Northwest Structures, Inc. (A)
P. O. Box 5235
Spokane 11, Wash.

Potlatch Forests, Inc. (A)
Lumber Division
Lewiston, Idaho

Rosboro Lumber Co. (A)
P. O. Box 1098
Springfield, Oreg.

Rother Lumber Co. (A)
P. O. Box 1529
Missoula, Mont.

Standard Structures, Inc. (A)
28 Francisco Blvd.
San Rafael, Calif.

Timber Laminators, Inc. (A)
P. O. Box 397
Ontario, Oreg.

Timber Products Co.
P. O. Box 268
Renton, Wash.

Timber Structures, Inc. (A)
Portland 8, Oreg.

Timberweld Manufacturing (A)
Columbus, Mont.

Trussfab, Inc. (A)
P. O. Box 66
Clackamas, Oreg.

Union Lumber Co. (C)
620 Market Street
San Francisco 4, Calif.
Plant: Fort Bragg, Calif.

Virginia Lee Homes, Inc. (A)
Kirkland, Wash.

Washington Timber Products, Inc. (A)
P. O. Box 610
Everett, Wash.

Woodlam, Inc. (A)
1476 Thorne Road
Tacoma, Wash.

Weyerhaeuser Co. (A)
Rilco Engineered Wood Products Div.
Tacoma, Wash.
Plant: Cottage Grove, Oreg.

Appendix 2

BUILDING PERMIT ACTIVITY, BY TYPE OF BUILDING CONSTRUCTION, IN THE U. S., THE SOUTH, AND SELECTED STATES AND CITIES -- 1957 THROUGH 1962

(in millions of dollars)

United States	1962	%	1961	%	1960	%	1959	%	1958	%	1957	%
All building construction	20,465.1	100	18,849.1	100	17,827.2	100	22,449.4	100	20,089.9	100	18,142.3	100
Community buildings	1,485.9	7.26	1,399.7	7.42	1,217.7	6.81	2,603.0	11.59	2,684.2	13.35	2,478.6	13.66
Educational buildings	501.1	2.44	514.0	2.72	436.6	2.45	1,513.6	6.74	1,644.3	8.18	1,491.8	8.22
Institutional buildings	517.8	2.53	441.3	2.34	337.3	1.89	576.8	2.57	569.5	2.83	522.6	2.88
Religious buildings	467.0	2.28	441.4	2.35	443.8	2.49	512.6	2.28	470.4	2.34	464.2	2.56
South												
All building construction	5,421.7	100	4,921.0	100	4,694.8	100	5,760.9	100	5,421.6	100	4,614.8	100
Community buildings	357.5	6.59	365.0	7.42	163.6	3.48	703.5	12.20	725.4	13.37	626.2	13.57
Educational buildings	103.7	1.91	113.0	2.30	72.8	1.55	398.8	6.92	444.2	8.19	348.9	7.56
Institutional buildings	112.5	2.07	109.1	2.21	76.0	1.62	151.7	2.63	137.3	2.53	137.0	2.97
Religious buildings	141.3	2.61	142.9	2.90	154.8	3.30	153.0	2.65	143.9	2.65	140.3	3.04
Georgia												
All building construction	362.8	100	343.2	100	301.1	100	348.2	100	321.3	100	252.4	100
Community buildings	22.8	6.28	14.0	4.08	23.2	7.72	46.4	13.32	43.7	13.62	41.9	16.64
Educational buildings	4.6	1.27	3.0	0.90	4.8	1.59	21.3	6.12	17.1	5.33	23.1	9.17
Institutional buildings	9.4	2.58	4.8	1.39	3.2	1.06	14.5	4.15	17.1	5.31	9.7	3.85
Religious buildings	8.8	2.42	6.1	1.79	15.2	5.06	10.6	3.05	9.5	2.97	9.1	3.62
Alabama												
All building construction	218.5	100	201.1	100	175.6	100	260.7	100	236.8	100	190.6	100
Community buildings	13.8	6.32	15.6	7.77	16.1	9.17	22.4	8.57	28.1	11.90	17.6	9.22
Educational buildings	2.4	1.10	6.7	3.35	3.3	1.88	5.7	2.18	13.2	5.59	10.9	5.74
Institutional buildings	5.1	2.34	2.7	1.34	5.7	3.23	8.1	3.09	8.1	3.43	.3	0.02
Religious buildings	6.3	2.89	8.6	4.29	7.1	4.05	8.6	3.30	5.4	2.88	6.6	3.46
Tennessee												
All building construction	212.4	100	208.2	100	191.1	100	261.2	100	234.6	100	179.3	100
Community buildings	14.0	6.59	15.4	7.42	6.6	3.48	31.8	12.20	31.3	13.37	24.3	13.57
Educational buildings	4.1	1.91	4.8	2.30	3.0	1.55	18.1	6.92	19.2	8.19	13.5	7.56
Institutional buildings	4.3	2.07	4.6	2.21	3.1	1.62	6.9	2.63	5.9	2.53	5.3	2.97
Religious buildings	5.5	2.61	6.0	2.90	6.3	3.30	6.9	2.65	6.2	2.65	5.4	3.04
North Carolina												
All building construction	233.5	100	224.3	100	217.2	100	267.5	100	231.7	100	194.3	100
Community buildings	15.4	6.59	16.6	7.42	7.6	3.48	32.6	12.20	30.9	13.37	26.3	13.57
Educational buildings	4.5	1.91	5.2	2.30	3.4	1.55	18.5	6.92	18.9	8.19	14.7	7.56
Institutional buildings	4.8	2.07	4.9	2.21	3.5	1.62	7.0	2.63	5.8	2.53	5.8	2.97
Religious buildings	6.1	2.61	6.5	2.90	7.2	3.30	7.1	2.65	6.1	2.65	5.9	3.04
South Carolina												
All building construction	63.2	100	58.2	100	61.1	100	84.8	100	74.0	100	63.4	100
Community buildings	4.2	6.59	4.3	7.42	2.1	3.48	10.3	12.20	9.9	13.37	8.6	13.57
Educational buildings	1.2	1.91	1.3	2.30	.9	1.55	5.9	6.92	6.1	8.19	4.8	7.56
Institutional buildings	1.3	2.07	1.3	2.21	1.0	1.62	2.2	2.63	1.9	2.53	1.9	2.97
Religious buildings	1.6	2.61	1.7	2.90	2.0	3.30	2.2	2.65	2.0	2.65	1.9	3.04
Atlanta, Ga.												
All building construction	251.7	100	201.1	100	207.2	100	213.6	100	205.9	100	143.6	100
Community buildings	15.8	6.28	8.2	4.08	16.0	7.72	28.5	13.32	28.0	13.62	23.9	16.64
Educational buildings	3.2	1.27	1.8	0.90	3.3	1.59	13.1	6.12	10.9	5.33	13.2	9.17
Institutional buildings	6.5	2.58	2.8	1.39	2.2	1.06	8.9	4.15	10.9	5.31	5.5	3.85
Religious buildings	6.1	2.42	3.6	1.79	10.5	5.06	6.5	3.05	6.1	2.97	5.2	3.62
Birmingham, Ala.												
All building construction	72.8	100	74.6	100	74.1	100	101.5	100	86.7	100	68.3	100
Community buildings	4.6	6.32	5.8	7.77	6.8	9.17	8.7	8.57	10.3	11.90	6.3	9.22
Educational buildings	0.8	1.10	2.5	3.35	1.4	1.88	2.2	2.18	4.8	5.59	3.9	5.74
Institutional buildings	1.7	2.34	0.1	1.34	2.4	3.23	3.1	3.09	2.9	3.43	.02	0.02
Religious buildings	2.1	2.89	3.2	4.29	3.0	4.05	3.3	3.30	2.5	2.88	2.4	3.46

Note: The current (1960-1962) series covers 3,014 of the more active permit-issuing places, which accounted for about 90% of the number and value of housing units authorized by all of the approximately 10,000 permit-issuing places identified in 1959. They include all permit-issuing places which issued 50 or more new housing units in 1959 and those which issued permits for 20 to 49 new housing units in 1959 in the following states: Alaska, Idaho, Maine, Mississippi, Montana, New Hampshire, North Dakota, South Dakota, Vermont, and Wyoming. The old (1957-1959) series covers approximately 6,600 permit-issuing places, which constituted the identified universe of such places in 1954.

Source: U. S. Department of Commerce, Construction Review (March issues, 1958-1963).

Appendix 3

CARLOAD RAIL FREIGHT RATES FOR GLUED LAMINATED LUMBER
(Rates in cents per 100 pounds)

TO:	FROM:															
	Rome Ga.		Atlanta Ga.		Waycross Ga.		Morrisville N. C.		Louisville Ky.		Greenville Ala.		Baton Rouge La.		Magnolia Ark.	
	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B
GEORGIA																
Rome	-	-	15	10½	30	21	48½	33½	36½	25½	24	17	47½	33	62½	41
Atlanta	15	10½	-	-	24½	17½	37½	26	41½	29	22	15½	49	34½	66	43½
Augusta	23½	16½	20	14	21½	15	27	19	50	35	32½	23	55	38½	75	49½
Columbus	19	13½	16	11½	21½	15	47	32½	48½	33½	17½	12	45	31½	59½	39
Macon	19	13½	15	10½	20	14	44	31	47½	33	23½	16½	49½	34½	69	45½
ALABAMA																
Birmingham	17	12	19	13½	32½	23	49	34½	36½	25½	18	12½	38½	27	51	33
Montgomery	21	15	20	14	25	17½	49	34½	45	31½	15	10½	27	19	51	33
TENNESSEE																
Chattanooga	15	10½	17½	12	36½	25½	45	31½	29	20½	26½	18½	49	34½	55	36½
Knoxville	18	12½	21	15	42	29½	34½	24	25	17½	35½	25	53	37	65½	43½
Nashville	23	16	26½	18½	48	33½	51½	36	20½	14½	32	22½	49	34½	49	32
NORTH CAROLINA																
Asheville	26	18	24	17	36½	25½	24	17	36½	25½	43	30	58	40½	73	48½
Charlotte	31	21½	23½	17½	32	22½	18	12½	47½	33	44	31	59	41½	79	53
SOUTH CAROLINA																
Columbia	27	19	23½	16½	23½	16½	21½	15	48½	33½	41½	29	58	40½	78	52½
Greenville	23	16	18½	13	29	20½	24½	17½	46	32	34½	24	55	38½	75	50½

Notes: Rates from Magnolia, Arkansas, are based on minimum weights of 50,000 pounds from origin to either Vicksburg or Memphis. Shipments over Vicksburg have a rate of 24¢ for 50,000 pounds and 14¢ for excess of 50,000 pounds; shipments by way of Memphis have rates of 26¢ and 16¢. From Memphis and Vicksburg to destination, rates on 40,000 pounds are in effect. Shipments from Magnolia are made over Vicksburg to Georgia and Alabama cities; over Memphis to North Carolina, South Carolina, and Tennessee cities.

A = Rate based on minimum weight of 40,000 pounds; on shipments weighing in excess of 40,000 pounds, rate is also applicable on first 40,000 pounds in or on car.

B = Rate for weight in excess of 40,000 pounds, but less than 60,000 pounds, loaded in or on same car.

Appendix 4

TRUCKLOAD MOTOR FREIGHT RATES FOR GLUED LAMINATED LUMBER

(Rates in cents per 100 pounds)

TO:	FROM:							
	Rome Ga.	Atlanta Ga.	Way-cross Ga.	Morris-ville N. C.	Louis-ville Ky.	Green-ville Ala.	Baton Rouge La.	Mag-nolia Ark.
GEORGIA								
Rome	-	9	41	59	49	30	67	76
Atlanta	9	-	33	51	56	27	71	81
Augusta	30	21	25	37	74	45	89	101
Columbus	20	14	25	65	69	17	61	73
Macon	20	12	22	52	68	29	73	85
ALABAMA								
Birmingham	15	21	45	71	49	18	52	61
Montgomery	25	22	33	73	61	06	50	61
TENNESSEE								
Chattanooga	10	17	49	60	39	36	70	69
Knoxville	19	24	57	46	34	49	84	83
Nashville	29	36	68	79	23	43	72	59
NORTH CAROLINA								
Asheville	35	31	50	30	50	58	100	99
Charlotte	41	33	43	19	67	60	104	114
SOUTH CAROLINA								
Columbia	37	29	30	26	70	55	100	110
Greenville	28	19	40	32	62	46	91	100

Note: Rates are based on minimum weight of 35,000 pounds per truckload.